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In re application of	:	**Confirmation No. 2975**
Taichi SHINO et al.	:	Docket No. 2000_1452A
Serial No. 09/695,869	:	Group Art Unit 2675
Filed October 26, 2000	:	Examiner Chanh Duy Nguyen
AC PLASMA DISPLAY PANEL FOR REDUCING THE EMISSION OF ELECTROMAGNETIC WAVES GENERATED BY DISPLAY ELECTRODES AND CONDUCTORS	:	**Mail Stop Amendment**

SUBMISSION OF VERIFIED TRANSLATION OF FOREIGN PRIORITY DOCUMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

THE COMMISSIONER IS AUTHORIZED TO CHARGE ANY DEFICIENCY IN THE FEES FOR THIS PAPER TO DEPOSIT ACCOUNT NO. 23-0975

Sir:

A verified English language translation of the foreign priority document (JP 11-305052) of the above-identified application is submitted herewith to perfect the priority date of October 27, 1999 for the application. The claims of the present application are fully supported by the priority document.

Respectfully submitted,

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Applicant: Taichi SHINO et al. : Art Unit:
Serial No.: 09/695,869 : Examiner:
Filed: October 26, 2000
FOR: AC PLASMA DISPLAY PANEL FOR REDUCING THE EMISSION OF ELECTROMAGNETIC WAVES GENERATED BY DISPLAY ELECTRODES AND CONDUCTORS

VERIFICATION OF A TRANSLATION

Assistant Commissioner for Patents
Washington, D.C. 20231
SIR :

I, the below named translator, hereby declare that:

1. My name and post office address are as stated below.

2. That I am knowledgeable in the English language and in the language of JPH11-305052, and I believe the attached English translation to be a true and complete translation of JPH11-305052.

3. The document for which the attached English translation is being submitted is a patent application on an invention entitled AC PLASMA DISPLAY PANEL FOR REDUCING THE EMISSION OF ELECTROMAGNETIC WAVES GENERATED BY DISPLAY ELECTRODES AND CONDUCTORS.

11-305052

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[ADDRESS] Director-General of the Patent Office

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[REPRESENTATION OF FEE]

[NUMBER IN LEDGER OF IN-ADVANCE PAYMENT] 011305

[AMOUNT] 21000

[Name of the Document] Specification

[Title of the Invention] AC Type Plasma Display Panel

[Claims]

[Claim 1] An AC type plasma display panel, comprising two substrates with a discharge space provided therebetween, a plurality of scanning electrodes and sustaining electrodes adjoining each other to form a row on one of the substrates, and a conductor which has a function of generating electromagnetic waves being reverse in polarity to electromagnetic waves generated by current flowing in the scanning electrode and the sustaining electrode when a sustaining pulse voltage is applied between the scanning electrode and the sustaining electrode.

[Claim 2] The AC type plasma display panel of claim 1, wherein the conductor is connected to either one of the scanning electrodes and the sustaining electrode.

[Claim 3] The AC type plasma display panel of claim 1 or 2, wherein the electrode are disposed in all rows respectively.

[Claim 4] The AC type plasma display panel of claim 3, wherein the scanning electrodes, sustaining electrodes, and conductors in adjoining rows are reverse in arrangement order to each other.

[Claim 5] The AC type plasma display panel of any one of claims 1 to 4, wherein the scanning electrodes, sustaining electrodes, and conductors are covered with a dielectric layer, and there is provided a barrier on the dielectric layer in a region between the rows.

[Claim 6] The AC type plasma display panel of claim 5, wherein the barrier made of light absorbing material.

respectively drawn out of the panel in directions reverse to each other.

[0003]

That is, scanning electrodes SCN_1, SCN_3, ... SCN_{2M-1} in odd-numbered rows are drawn out to the left side of panel 1 and connected to scanning electrode driving circuit 2a for driving them, and sustaining electrodes SUS_1, SUS_3, ... SUS_{2M-1} in odd-numbered rows are drawn out to the right side of panel 1 and connected to sustaining electrode driving circuit 3a for driving them. Also, scanning electrodes SCN_2, SCN_4, ... SCN_{2M} in even-numbered rows are drawn out to the right side of panel 1 and connected to scanning electrode driving circuit 2b for driving them, and sustaining electrodes SUS_2, SUS_4, ... SUS_{2M} in even-numbered rows are drawn out to the left side of panel 1 and connected to sustaining electrode driving circuit 3b for driving them. Further, data electrodes D_1 to D_N are drawn out to the upper side of panel 1 and connected to data electrode driving circuit 4 for driving them.

[0004]

In conventional panel 1, when a sustaining pulse voltage for generating sustaining discharge is applied to a sustaining electrode or scanning electrode, electromagnetic wave is generated in each row because pulse current with a very short time width that does not contribute to light emission flows in each row, but the current flows in directions reverse to each other in adjoining rows, and therefore, electromagnetic waves generated cancel each other because of being reverse in polarity.

[0005]

[Problems to be Solved by the Invention]

However, in case the operation of scanning electrode driving circuit 2a

the path in which the current flows is shorter for the discharge cell located on the left side of the panel as compared with the length thereof for the right side of the panel. Accordingly, due to voltage drop caused by the resistance of electrodes, the voltage applied between the scanning electrode and the sustaining electrode in each discharge cell varies with the discharge cells, and there arises a problem that the brightness becomes uneven because of change in intensity of the discharge.

[0008]

The present invention is intended to solve such problem, and the object is to provide a panel having excellent display quality which is extremely less in generation of electromagnetic waves and free from uneven brightness.

[0009]

[Means to Solve the Problem]

The AC type plasma display panel of the present invention comprises two substrates with a discharge space provided therebetween, a plurality of scanning electrodes and sustaining electrodes adjoining each other to form a row on one of the substrates, and a conductor which has a function of generating electromagnetic waves being reverse in polarity to electromagnetic waves generated by current flowing in the scanning electrode and the sustaining electrode when a sustaining pulse voltage is applied between the scanning electrode and the sustaining electrode.

[0010]

In this configuration, it is possible to realize that the electromagnetic wave emitted by current flowing in the scanning electrode and sustaining electrode and the electromagnetic wave emitted by current flowing in the

respectively from the right side of the panel and connected to sustaining electrode driving circuit 7 from the left side of the panel. Further, data electrodes D_1 to D_N are connected to data electrode driving circuit 4 from the upper side of the panel.

[0013]

As the first embodiment of panel 5, its perspective view partly broken away is shown in Fig. 2. In Fig. 2, a plurality of scanning electrodes 10 (SCN_j), sustaining electrodes 11 (SUS_j), and conductors 12 (CW_j) which are covered by dielectric layer 9 are disposed on first insulating substrate 8 in the direction of row, and there is provided protective film 13 on dielectric layer 9. Scanning electrode 10 is formed of transparent electrode 10a and bus 10b disposed in overlapping relation therewith, and similarly, sustaining electrode 11 is formed of transparent electrode 11a and bus 11b disposed in overlapping relation therewith. Since the resistance of transparent electrode is generally high, the resistance as electrode is lowered by disposing a bus formed from silver or the like in overlapping relation with transparent electrode. Also, conductor 12 is formed from silver or like material being low in resistance.

[0014]

A plurality of data electrodes 15 (D_i) are disposed on second insulating substrate 14 in the direction of column, and between data electrodes 15 is provided partition 16 being parallel to data electrode 15. Phosphor 17 is disposed on the surface of data electrode 15 and on the side of partition 16, and the first insulating substrate 8 and the second insulating substrate 14 are opposing to each other. Also, a mixed gas of xenon and at least one of

discharge takes place in the discharge cell for display when scanning is executed on the second row through the 2M-th row.

[0018]

In a sustaining period after the writing period, when negative sustaining pulse voltage –Vm (V) is first applied from sustaining electrode driving circuit 7 to all sustaining electrodes SUS_1 to SUS_{2M} through conductors CW_1 to CW_{2M}, initial sustaining discharge takes place between scanning electrode SCN_j and sustaining electrode SUS_j at the discharge cell that has executed writing discharge, and then sustaining discharge current flows from scanning electrode driving circuit 6 toward sustaining electrode driving circuit 7 through scanning electrode SCN_j, sustaining electrode SUS_j, and conductor CW_j. Subsequently, negative sustaining pulse voltage –Vm (V) is alternately sequentially applied from scanning electrode driving circuit 6 and sustaining electrode driving circuit 7 to all sustaining electrodes SUS_1 to SUS_{2M} respectively through all scanning electrodes SCN_1 to SCN_{2M} and conductors CW_1 to CW_{2M}, and thereby, sustaining discharge is continuously executed between scanning electrode SCN_j and sustaining electrode SUS_j at the discharge cell that has executed writing discharge, and then, there arises an alternate flow of sustaining discharge current that flows toward scanning electrode driving circuit 6 from sustaining electrode driving circuit 7 through conductor CW_j, sustaining electrode SUS_j, and scanning electrode SCN_j, and of sustaining discharge current that flows toward sustaining electrode driving circuit 7 from scanning electrode driving circuit 6 through scanning electrode SCN_j, sustaining electrode SUS_j, and conductor CW_j. Light emission due to such continuous sustaining

As shown in Fig. 5 (b) and (c), the sustaining discharge current that flows with the sustaining pulse voltage applied is composed of Id and Ic. Id is a discharge current that contributes to actual light emission and slowly flows a while after application of the sustaining pulse voltage. On the other hand, Ic is a current that flows in the electrostatic capacity component between the scanning electrode and the sustaining electrode, whose time width is very narrow and peak waveform is very sharp, and the current is ineffective with respect to light emission, causing electromagnetic waves to be generated. In Fig. 5, the time axis scale for the first half is different from that for the second half for the convenience of description.

[0023]

As is obvious in Fig. 4, sustaining discharge current (thick solid-line arrow) that flows from scanning electrode driving circuit 6 to scanning electrode SCN_{2J-1} and sustaining electrode SUS_{2J-1} goes to sustaining electrode driving circuit 7 through conductor CW_{2J-1} as shown by thick broken-line arrow. That is, as shown in each of Fig. 5 (b) and Fig. 5 (c), the current that flows in scanning electrode SCN_{2J-1} and sustaining electrode SUS_{2J-1} and the current that flows in conductor CW_{2J-1} are same in level and reverse in direction, and there arises no time lag with respect to their current waveforms. Accordingly, electromagnetic waves emitted due to these currents are reverse in polarity and cancel each other.

[0024]

In sustaining discharge continuously generated, such phenomena as described above will also take place. That is, electromagnetic waves radiated due to current flowing in scanning electrode SCN_{2J-1} and

similarly canceled. Accordingly, all the electromagnetic waves due to currents flowing in the (2J−1)th and 2J-th rows are canceled.

[0027]

In the above description, the effects of the electrodes in the (2J−1)th and 2J-th rows are described, but it is cleat that the same holds true for the other rows. That is, the current flowing in scanning electrode SCN_j and sustaining electrode SUS_j during sustaining discharge and the current flowing in conductor CW_j simultaneously flow in reverse directions, and therefore, electromagnetic waves generated due to currents flowing in scanning electrode SCN_j and sustaining electrode SUS_j are reverse in polarity to electromagnetic waves generated due to current flowing in conductor CW_j, which are therefore completely canceled. Also, since the current flowing in the electrostatic capacitance between conductor CW_j and scanning electrode SCN_{j+1} in the next row adjoining thereto flows in directions reverse to each other, the electromagnetic wave generated due to the current is also individually canceled. Accordingly, electromagnetic waves radiated outside the panel can be suppressed.

[0028]

Also, in the panel of this preferred embodiment, the sum of the length of the path in which the current flows from scanning electrode driving circuit 6 to the discharge cell and the length of the path in which the current flows from the discharge cell to sustaining electrode driving circuit 7 is constant irrespective of the position of the discharge cell in the panel. Accordingly, the voltage applied between the scanning electrode and the sustaining electrode in each discharge cell is nearly same in level, and the

scanning electrode 10 adjacent thereto in the next row fairly weakens. As a result, it is possible to further prevent the generation of faulty discharge between conductor 12 and scanning electrode 10 in the next row.

[0031]

Also, barrier 19 shown in Fig. 6 and Fig. 7 is formed from light absorbing material, and thereby, the panel contrast can be enhanced by suppressing the amount of reflection of external light. As the light absorbing material, it is possible to use glass material same as for dielectric layer 9 in which ruthenium oxide, manganese dioxide, chrome oxide, nickel oxide or the like is mixed.

[[0032]

In the first preferred embodiment of the present invention, the description refers to an example in which the scanning electrode driving circuit is connected to scanning electrode, and the sustaining electrode driving circuit is connected to conductor connected to the sustaining electrode, but it is also possible to adopt a configuration in which a conductor is electrically connected to a scanning electrode, the scanning electrode driving circuit is connected to conductor, and the sustaining electrode driving circuit is connected to sustaining electrode, and thereby, the current flowing in the scanning electrode and the sustaining electrode is reverse in direction to the current flowing in the conductor.

[0033]

The panel and its driving apparatus as the second preferred embodiment of the present invention are shown in Fig. 8. In Fig. 8, panel 20 is different from panel 5 in the preferred embodiment 1 with respect to

The driving method for panel 20 is same as the driving method in the first preferred embodiment described by using the operation drive timing chart of Fig. 3. The effects of the panel and its driving apparatus in the second preferred embodiment of the present invention will be described in the following.

[0036]

As a part of the electrode arrangement of panel 20 shown in Fig. 8, the electrode layout in the (2J−1)th and 2J-th rows is shown in Fig. 9. In Fig. 9, sustaining discharge current that flows during the initial sustaining discharge in the sustaining period is shown. As is obvious in Fig. 9, since the sustaining discharge current flowing from scanning electrode driving circuit 6 to scanning electrode SCN_{2J-1} and sustaining electrode SUS_{2J-1} forming a pair flows to sustaining electrode driving circuit 7 through conductor CW_{2J-1}, the direction of sustaining discharge current (thick solid-line arrow) that flows in scanning electrode SCN_{2J-1} and sustaining electrode SUS_{2J-1} is reverse to the direction of current (thick dotted-line arrow) that flows in conductor CW_{2J-1}. These currents are supplied from the driving circuit, either scanning electrode driving circuit 6 or sustaining electrode driving circuit 7, and therefore, the currents simultaneously flow in reverse directions. Accordingly, electromagnetic waves radiated due to the current flowing from scanning electrode SCN_{2J-1} to sustaining electrode SUS_{2j-1} forming a pair during sustaining discharge are reverse in polarity to electromagnetic waves radiated due to the current flowing in conductor CW_{2J-1}, and the electromagnetic waves cancel each other. Also, for example, since scanning electrode SCN_{2J-2} and scanning electrode SCN_{2J-1}

they are arranged in the order of conductor, sustaining electrode and scanning electrode in odd-numbered rows and in the order of scanning electrode, sustaining electrode and conductor in even-numbered rows, that is reverse to the order in odd-numbered rows. Also, it is preferable to electrically connect conductors to scanning electrodes, to connect the scanning electrode driving circuit to conductors, and to connect the sustaining electrode driving circuit to sustaining electrodes so that the current flowing in the scanning electrodes and sustaining electrodes is reverse in direction to the current flowing in the conductors.

[0040]

Also, in each of the above preferred embodiments, an example of conductor arrangement in each row has been described, but it is also preferable to dispose one conductor corresponding to scanning electrodes and sustaining electrodes in a plurality of rows so that the total of current flowing in a plurality of scanning electrodes and sustaining electrodes flows in the one conductor. For example, it is preferable to dispose one conductor at the end of the panel so that the total of current flowing in all scanning electrodes and sustaining electrodes flows in the one conductor. In this case, the electromagnetic wave canceling effect is less as compared with the case of disposing a conductor in each row, but it is possible to suppress electromagnetic waves radiated outside the panel to such an extent as not to give bad influences to other electronic apparatuses depending upon the panel size and the like.

[0041]

The above description also holds true for an AC type plasma display

Fig. 5 is a diagram showing a pulse voltage and sustaining discharge current applied to the electrode shown in Fig. 4.

Fig. 6 is a partly sectional view of the second embodiment of the panel.

Fig. 7 is a partly sectional view showing a modification of the panel of Fig. 6.

Fig. 8 is a schematic diagram showing a panel and its driving apparatus in the second preferred embodiment of the present invention.

Fig. 9 is a diagram partly showing the electrode arrangement and driving apparatus of the panel.

Fig. 10 is a schematic diagram showing a conventional panel and its driving apparatus.

[Description of the Reference Numerals and Signs]

4 Data electrode driving circuit

5, 20 Panel in one preferred embodiment of the present invention

6 Scanning electrode driving circuit

7 Sustaining electrode driving circuit

8 First insulating substrate

9 Dielectric layer

10 Scanning electrode

11 Sustaining electrode

12 Conductor

13 Protective coat

14 Second insulating substrate

15 Data electrode

16 Partition

[Name of the Document] Abstract

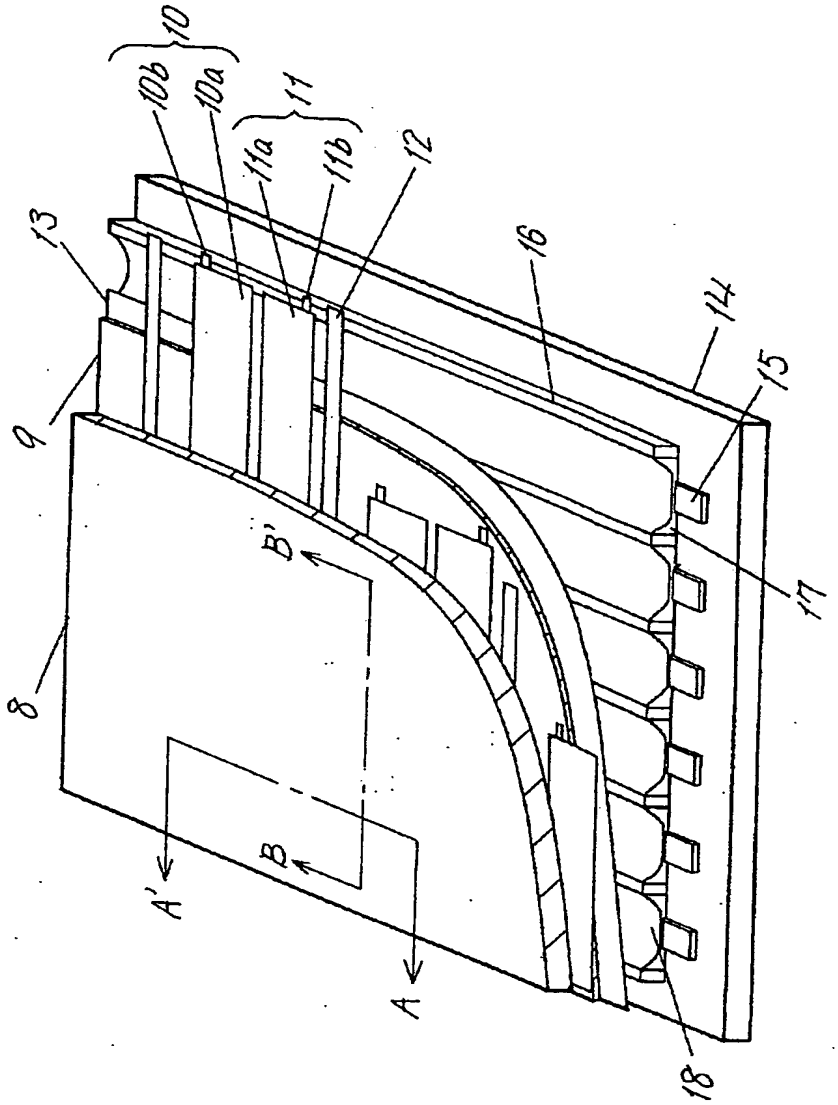
[Abstract]

[Object] The object of the invention is to provide an AC type plasma display panel which is extremely less in emission of electromagnetic waves and free from causing uneven brightness.

[Means to Solve the Problem] Panel 5 is provided with scanning electrode SCN_j and sustaining electrode SUS_j (j = 1 to 2M) of 2M rows in pair, and data electrode D_i (i = 1 to N) of N columns which are arranged perpendicularly opposite thereto, thereby forming a matrix configuration. Also, conductor CW_j being parallel to scanning electrode SCN_j and sustaining electrode SUS_j is arranged in each row. Scanning electrodes SCN_1 to SCN_M are connected to scanning electrode driving circuit 6 from the left of the panel, and conductors CW_1 to CW_M are electrically connected to sustaining electrodes SUS_1 to SUS_M at the right side of the panel and connected to sustaining electrode driving circuit 7 from the left of the panel. When sustaining pulse voltage is applied, the direction of sustaining discharge current that flows in scanning electrode SCN_j and sustaining electrode SUS_j is reverse to the direction of current that flows in conductor CW_j.

[Selected Drawing] Fig. 1

[Fig. 2]



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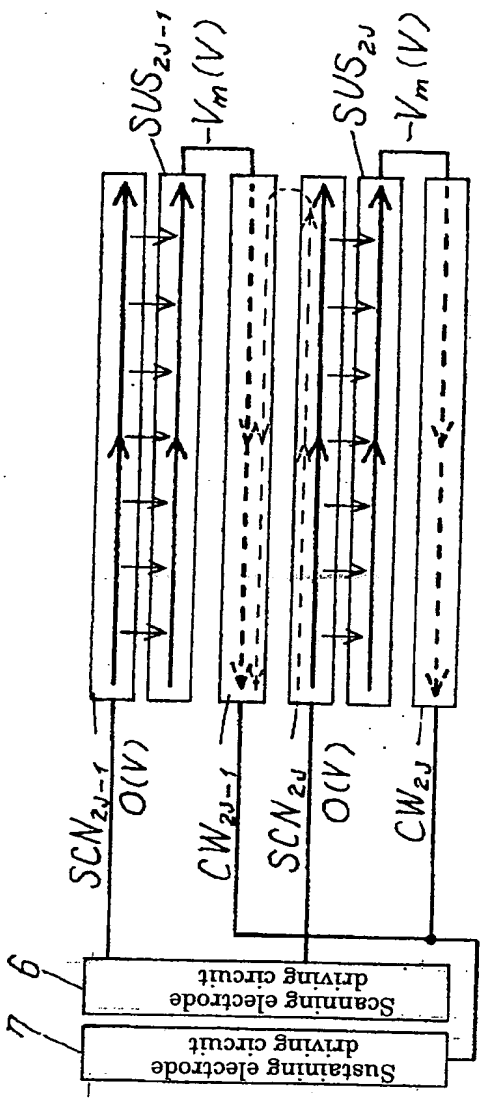
[Fig. 4]



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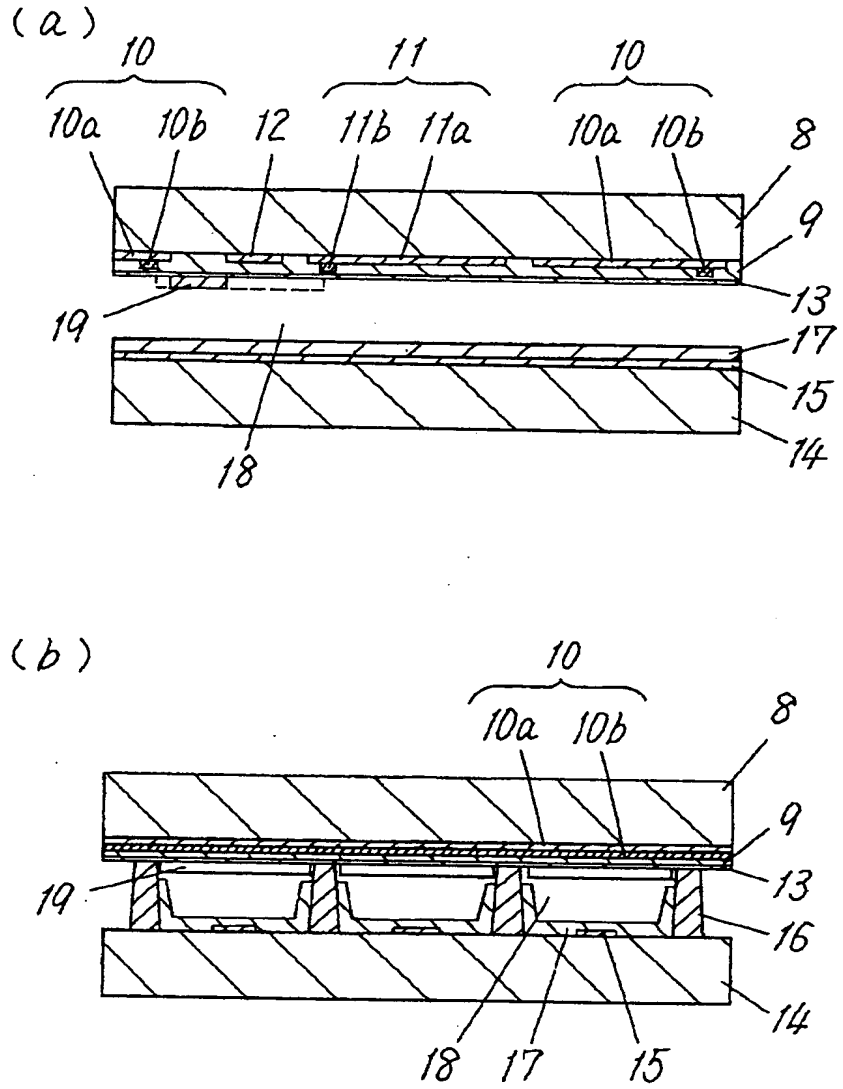
[Fig. 6]



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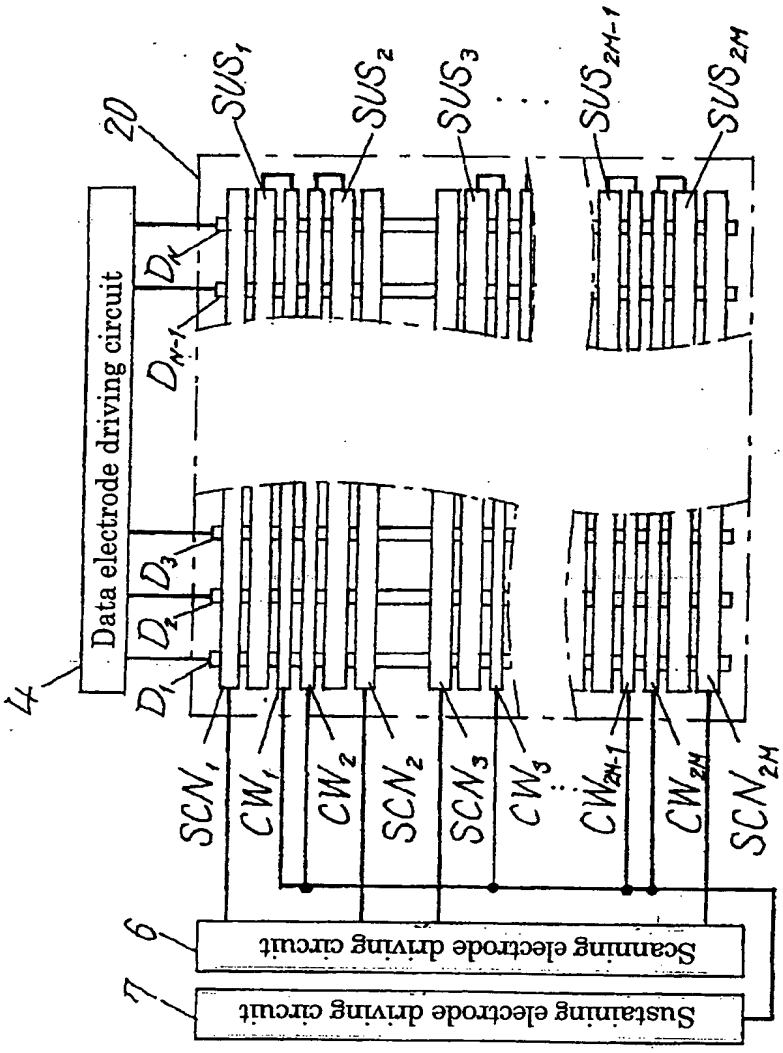
[Fig. 8]



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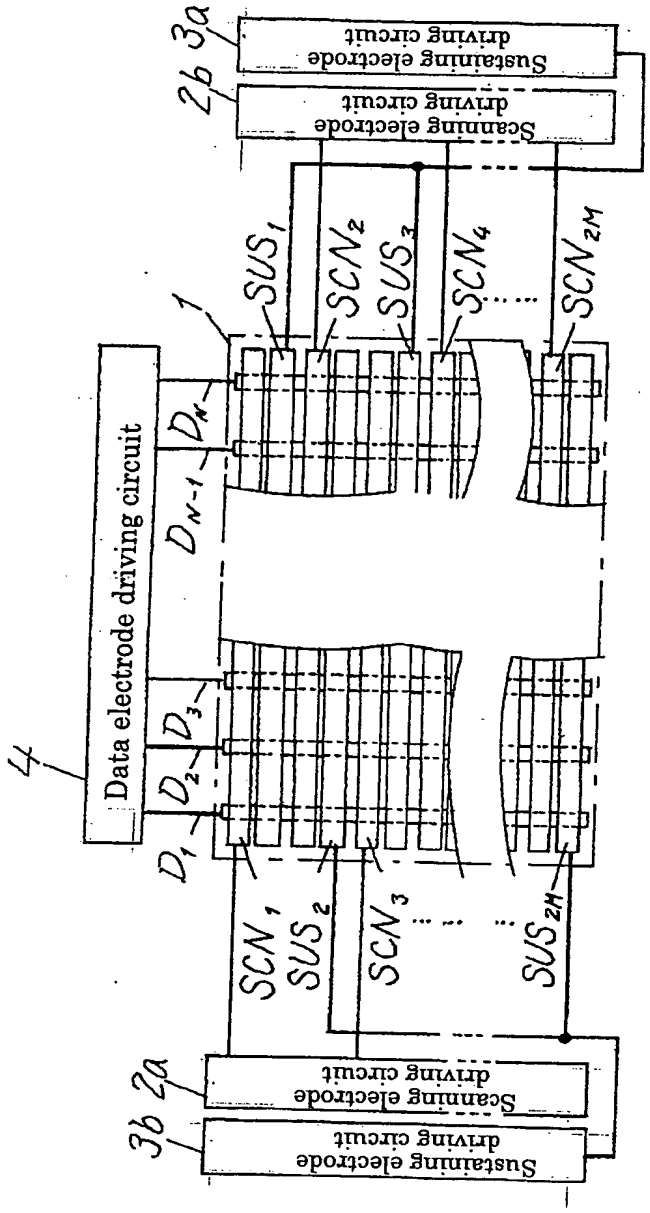
[Fig. 10]



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